Channel conveyance and flood risk: Are current models missing the mark?

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River floods are environmental hazards that can have devastating effects on human life, agriculture, and infrastructure. Hydrologic models are used to map flood hazards to better understand risk, dictate insurance

costs, and inform land-use planning. However, new research being presented Wednesday at the Geological Society of America's GSA Connects 2024 meeting suggests that these models may be missing a key variable that could underestimate risk.

Channel conveyance—or the volume of water a river channel can hold in its banks—is calculated by measuring the depth and width of a river channel. Most hydrologic models assume that channel conveyance is constant, but this is based on periodic measurements that can be taken decades apart.

Brooke Santos, the presenter, questioned the consistency of channel conveyance and worked with the Yanites' Research Group at Indiana University (IU) to better understand the relationship between channel conveyance and flood hazards.

The team collected aerial images and used structure from motion photogrammetry to make 3D reconstructions of river landscapes before, immediately after, and six years following Typhoon Morakot, Taiwan's deadliest recorded typhoon. Santos measured channels at each interval and identified up to 10 m of sediment deposition in rivers immediately following the typhoon.

"There's a thought that flooding incises, or removes, the sediment in a channel, but we're seeing that floods actually deposit a significant amount of sediment into these channels," says Santos. "This increased sediment will impact channel conveyance because it changes the river's depth."

Santos then used the reconstructions as a base for hydrologic models to create maps of flood risks for each interval at varying flood intensities. She found that the landscapes following Typhoon Morakot had a greater flood area, and these results suggest that changes in channel conveyance

can result in an increased area of hazard.

Although this research was conducted in Taiwan, Santos notes that their results can be applicable to many areas as changes in channel conveyance have been measured globally.

"Debris flows, earthquakes, large precipitation events, and other processes that result in an influx of sediment into a river system can change channel conveyance and impact flood hazards," according to Santos.

"It's important to include these changes in our models, especially as climate change can increase the frequency and severity of flooding."

More information: Presentation: T52. Impact of Contemporary Climate Change and Human Activities on Geomorphological Hazards

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